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horizontal force, were observed at about 20 stations, and these observations are at present in course of reduction.

Kew Observatory.

The photographic solar observations have proceeded during the last year with great regularity, under the superintendence of Mr. De La Rue, and have been so much favoured by the weather, that on 226 days 381 photograms have been taken, a result far exceeding that of any previous year. The reductions and investigations necessary for the intended determination of the Sun's elements have progressed vigorously, and are now completed up to the end of the year 1869, while two independent papers, one having reference to a distinct law in the form of the sun-spot curve, and published by the Royal Society; the other, giving further evidence of the interplanetary relations of the Sun as shown by its activity, and handed in for publication,—have also been prepared during that time. The special summary for last year will be laid before the Royal Astronomical Society very shortly.

The past year is the last in the ten-yearly period during which the Photoheliograph at Kew has been at work, and within a very few days the continuous photographic record of the Sun's disk will in this country draw to a close. How great a loss this is for astronomical science, especially at the present time when the inquiries into the physical nature of the Sun form so prominent a part in the activity of astronomers, will be seen by the statement that during these ten years no less than 2778 solar photograms have been taken, preserving almost for all time the most faithful record of fleeting phenomena, still surrounded with profound mystery and great interest, and still promising the most surprising disclosures of the widest bearing. About twenty papers, embodying laborious investigations and discussions, have been communicated during that time to the Royal Society and the Royal Astronomical Society, by the observers engaged in the Kew solar researches, and have been published.

The completion of the reductions for the years 1870 and 1871, as well as the final discussion of the whole series, will be completed at Mr. De La Rue's expense, and will take about one year and a half. The paper containing this last instalment of the work will, it is confidently expected, be a conclusive proof in itself that solar-eye observations can no longer compete with photographic in the absolute reliability of the facts deduced. Concurrently with the discussion of the Sun-spots, the relative amount of faculæ will be measured in the Kew pictures, as there is reason to think that important conclusions may be drawn in regard of solar activity by a study of the faculæ. All the Kew pictures may not be available for this purpose, but in future, pictures can be taken in which the faculæ will be most carefully defined, by so regulating the exposure of the photograph that these entities may be rendered very

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conspicuous. It is satisfactory that there is a prospect that a record of the Sun's activity will be continued by the Wilna Photoheliograph; and that, after the lapse of a year or two, a new Photoheliograph, with all those improvements and perfections which advanced knowledge and past shortcomings have suggested, will be erected in this country by Mr. De La Rue. In the meantime the Royal Society have sanctioned the replacement of the secondary magnifier (an ordinary Huyghenian eye-piece) of the Kew instrument by a positive eye-piece achromatised for the chemical rays, as in the Wilna instrument.

Statement of the work done at the Kew Observatory with the Heliograph.

Year.	Number of Days of Observations.	Number of Pictures Obtained.	Remarks.
1862	163	227	Pictures taken at Cranford.
1863	125*	184	Instrument mounted at Kew. Pictures commenced in May.
1864	164	249	
1865	159	277	
1866	157	262	
1867	131	187	No observations made between Aug. 9 and Sept. 9; building under alteration.
1868	174	285	
1869	195	324	
1870	220	381	
1871	226	381	
1872	10	21	January only.
Total	1724†	2778	

Mr. Huggins' Observatory.

During the past year the large Grubb Equatoreal, and the new spectroscopes constructed for use with it, have been got into adjustment, and some work has been done, though the long continuance of bad weather during the autumn left but few favourable nights for observation.

Measures have been taken of the remarkable bands of absorption in the spectra of *Uranus* and *Neptune*. The spectra of Comet I. 1871 and Encke's Comet were found to be similar to those of former comets examined at Tulse Hill. An account of these observations and drawings of the appearance of Encke's Comet will be found in the *Proceedings of the Royal Society*.

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* Spots were unusually scarce this year.

† The number of good observation days seem to be greatest at the times of maximum spots.

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Some observations on the spectra of nebulæ, and on the motion of stars in the line of sight, are at present not completed; but it is expected that the velocity of *Sirius* from the Earth will be found to be smaller than the estimate which Mr. Huggins obtained with the less powerful instruments then at his command.

Some quite recent observations of the change of refrangibility of the Fraunhofer lines at the opposite limbs of the Sun appear to show a motion in the atmosphere producing the Fraunhofer lines greater than that which is indicated for the photosphere by the movements of the spots.

Mr. Bishop's Observatory.

The principal work of the past year has been the continuation of the charts or stars within three degrees north and south of the ecliptic, to the eleventh magnitude inclusive. It has been found necessary to introduce a considerable increase in the measure of the square degree for those parts of the ecliptic where it is traversed by the Galaxy, in order to show distinctly the great number of small stars which the charts include. Much additional zone-work has also been required, but the whole is now in a sufficiently advanced state to allow of the re-issue of the charts commencing in the present month, with the hope of maintaining a regular publication during the year. In this district, the nights available for small-star-work have been by no means up to the average. Encke's comet has been satisfactorily observed for position on sixteen nights up to December 6. The small comet, discovered by M. Tempel, on November 3, was observed on four nights. It is Mr. Bishop's intention to combine calculation, with observation, in the proceedings of his Observatory. During the past year a full discussion of the observations of the Great Comet of 1861 has been completed by Mr. W. E. Plummer: the number of observations approaches one thousand; all sensible planetary perturbations have been taken into account, and the final orbit depends upon normals on which the whole of the observations about the respective dates have been brought to bear. The main result of the investigation is to indicate that the comet was moving in an ellipse with a period of 402 years; the details are now in course of arrangement for publication. Upon the suggestion of Mr. Hind, Mr. Bishop has undertaken the calculation of the effect of planetary attraction upon Encke's comet during the next revolution, and hence the preparation of an ephemeris for the reappearance in the spring of 1875. Very little has been done in England in this department of astronomy, and although it has been announced by the German Astronomical Society that an experienced computer proposes to occupy himself with a similar investigation, it appears to be intended to apply a new method, and it will be at least satisfactory in this case to possess a duplicate calculation. Mr. Plummer is now engaged in the preliminary correction of the predicted elements from the observations of 1871, after which he will apply